



## The Cancer Knowledge Cloud *caBIG® Podcast Network*

### **Moderator:**

Welcome to the caBIG® podcast network. Today, we'll be hearing about the **Cancer Knowledge Cloud**—a new approach to cancer research designed to accelerate discovery and development of new treatments and improved patient care.

Joining us today is Doctor Ken Buetow, who's a geneticist by training and now serves as the Director of the National Cancer Institute's Center for Biomedical Informatics and Information Technology. Dr. Buetow leads the bioinformatics program that is linking cancer researchers across the country to share data and collaborate on research into this disease. Thanks for sharing your work with us today, Dr. Buetow.

### **Dr. Buetow:**

My pleasure.

### **Moderator:**

In part 1 of our podcast series, you talked about the complexity of cancer. You also mentioned that because of that complexity, it was necessary to collect and analyze a tremendous amount of information. Can you describe why information management is such a challenge in this disease?

### **Dr. Buetow:**

Sure. First imagine there is a lady living here in Washington DC who is diagnosed with breast cancer. She sees multiple physicians and has many tests to get properly diagnosed, she undergoes surgery, she receives radiation treatment and treatment with Drug A, and eventually she gets well. Along the way, the doctors will collect pages and pages of information about her case. Now, multiply her information by one and a half MILLION—the number of Americans who get diagnosed each year with cancer.

All the information is currently kept in records of doctors' offices and hospitals around the country. Generally speaking, that information isn't shared beyond one institution's walls, making it almost impossible to capture the details of what happened to those million and a half Americans in any organized way.

Now picture a researcher on the other side of the country, say in San Francisco. That researcher studies cancer at the molecular level, and he's discovered a new biomarker that suggests that women with a certain type of breast cancer—in which



a certain gene is over-active—may benefit from Drug B, but not from Drug A. Now picture thousands of researchers like him—all studying different types of cancer, scanning thousands of different genomic profiles and generating mountains of data along the way.

Simply managing those data is daunting, but we can do that today. What's more challenging is *connecting* all the data from millions of patients, thousands of doctors and hospitals, and thousands of researchers so we can use it to benefit patients.

### **Moderator:**

Why do you need to connect the data? What good does that do?

### **Dr. Buetow:**

Let's go back to my example of the woman with breast cancer in Washington and the researcher in San Francisco. The way research is conducted today, it may take that several years to test his theory, even though tens of thousands of women may have the particular biomarker that he discovered. And there is no way for the doctor in Washington DC to know that his patient should be getting Drug B and not Drug A for her type of breast cancer.

But, if you can *connect* all the information from clinical care and link it to all the research information on biomarkers and genetic sub-groups you can advance more quickly. Without that connection there are a lot of delays, and a lot of repetitious efforts, and a lot of discovery that just can't happen.

### **Moderator:**

If being "connected" is so important, what is NCI doing about that?

### **Dr. Buetow:**

Well, the first step was to build the cancer Biomedical Informatics Grid, known as caBIG®. caBIG® is comprised of infrastructure, software tools—a network—and it gives cancer researchers at the over 60 NCI Cancer Centers around the country the ability to share their data and access data from others. The caBIG® community is the most extensive network of biomedical researchers in the world.

Now we're embarking on the next step, which we call the Cancer Knowledge Cloud. The caBIG® network represents the essence of an interconnected cancer community in which information can be combined and shared. The Cloud allows institutions and individuals to access rich and diverse collections of resources literally anywhere in the world.



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**Moderator:**

So stepping back a minute, can you explain what actually makes the Cloud work?

**Dr. Buetow:**

Sure, it's actually pretty straightforward. The Cancer Knowledge Cloud uses the caBIG® network called caGrid to connect information that lives locally at a particular geographic site—say, in a physician's office or maybe in a large scale data bank that holds information on genomic research.

caGrid uses standards to enable those geographically distributed resources to communicate and share information. As Cloud participants access information through caGrid, they can use analytic tools to sample and utilize the information so that they can derive knowledge from it. And all this occurs with appropriate safeguards of privacy and protection that allow the whole to be more than the sum of the parts.

**Moderator:**

Where exactly is the Cancer Knowledge Cloud *located*?

**Dr. Buetow:**

Well, like the Internet, the Cancer Knowledge Cloud exists in “cyberspace” as a network that links those who wish to access or share information. Like the World Wide Web, the Cancer Knowledge Cloud is not owned by any one entity, but it does have standards that govern its use so that information can be exchanged.

**Moderator:**

Can you describe who does what in the Cancer Knowledge Cloud?

**Dr. Buetow:**

The goal of the Cancer Knowledge Cloud is to have completely democratic access to the entire spectrum of information associated with cancer. We want full participation from all of the members of the cancer ecosystem, including patients, consumers, hospitals, researchers, practicing physicians—and each of these individual stakeholders has a critical role to play.

Researchers will be able to locate novel information and conduct next generation biomedical research effectively and efficiently by accessing clinical observations and quickly identifying patients available for clinical trials. They will also then funnel those findings into the Knowledge Cloud so that hospitals and practicing physicians are aware of the latest treatments in real time, as soon as they've received FDA approval.



Physicians will contribute clinical observations so that biomedical researchers have access to what's happening with real patients in real settings. Hospitals will actually analyze aggregated information on their broader collection of patients to better understand what's working and what's not working, and to find out how to deliver higher quality care in more effective and efficient means.

And lastly, consumers and patients will have electronic access to their information, and they will be able to choose to participate in state of the art clinical research studies, for instance. By having access to their molecular profiles as well as the rest of their health history, consumers will become the chief stewards of their own health, and will be able to make critical decisions associated with maintaining their health as well as being full participants in managing their disease, if and when it should occur.

For example, once you know your predisposition to certain cancers based on your genetics or family history, your PDA (or your iPhone, once you load a caBIG® application) might help you to prevent or preempt clinical symptoms by pointing out to you the right foods in the supermarket.

The Cancer Knowledge Cloud connects research and clinical care in order to speed new discoveries and ensure that those discoveries help patients as rapidly as possible.

### **Moderator:**

So, could you envision Knowledge Clouds for other diseases beyond cancer?

### **Dr. Buetow:**

Absolutely. The Cancer Knowledge Cloud is but a starting point toward generating a comprehensive biomedical knowledge cloud. Like the internet itself, it is straightforward for it to expand and grow. By having Biomedical Knowledge Clouds, information flows throughout all of the components of biomedicine so that treatment and care get smarter and we can achieve what is called a *learning healthcare system*. We are starting with cancer but certainly not stopping there, as this concept of sharing information to achieve smarter medicine can be applied to many other diseases.

### **Moderator:**

When will the Cancer Knowledge Cloud be ready?

### **Dr. Buetow:**

Well, I'm pleased to tell you that key components of the Cancer Knowledge Cloud already exist. That's because over the last five years the caBIG® community has pioneered the development of the basic infrastructure and the requisite applications necessary to make this vision a reality.



We already have data flowing, for example, from projects such as the NCI's Cancer Genome Atlas and its counterpart in pediatric cancer. Rich collections of biospecimens and their associated clinical data are already being shared, with appropriate access and security protections. And, we are also making new information emerging from clinical trials available at the point of patient care.

**Moderator:**

What will we hear about the Cancer Knowledge Cloud in the coming weeks?

**Dr. Buetow:**

These are exciting times for the Cancer Knowledge Cloud. caBIG® technology is being widely deployed at an escalating pace, and there are now more than a hundred nodes interconnected through caGrid to the Cancer Knowledge Cloud. This represents tremendous opportunities for the research community to share existing information, post new information, and to consume this new information in novel ways that we hope will rapidly advance our understanding of cancer and expedite the development of new therapeutics.

**Moderator:**

Finally, Dr. Buetow, how do we learn more about the Cancer Knowledge Cloud?

**Dr. Buetow:**

Well, the Cancer Knowledge Cloud is indeed in cyberspace, so we invite everyone to visit it at [www.CancerKnowledgeCloud.com](http://www.CancerKnowledgeCloud.com).

**Moderator:**

Thank you very much for your time Dr. Buetow. We look forward to our next podcast describing caBIG® and personalized medicine.

**Dr. Buetow:**

And thank you.